

CALIBRATION USING HORN IN THE PHASE AMPLITUDE METHOD
OF ANTENNA AXIAL RATIO MEASUREMENT

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The Overseas Telecommunications Commission utilises the INTELSAT satellite system to provide a range of international telecommunications services for Australia via spacecrafts located over the Pacific and Indian Ocean regions and earth stations situated at Melbourne, Moree, Ceduna and Carnarvon.

The rapidly growing demand for higher satellite transmission capacity in the INTELSAT system has necessitated the adoption of techniques which allow the efficient utilization of bandwidths presently allocated to the international-fixed-satellite service (IFSS) [1].

One method available to reduce spectral loading involves the reuse of existing frequencies through spatial isolation between multiple exclusive beams of identical frequency but different shape, size and canting angle designed to illuminate separate areas on earth. Another technique which enables frequency reuse is that provided by means of discrimination between orthogonal circular or linear polarizations [2].

The new INTELSAT V satellites [3] achieve a four-field reuse of frequencies in the assigned 6GHz transmit (5.925-6.425) and 4GHz receive (3.7-4.2) bands by virtue of spatially isolated East and West hemispheric beams and by discrimination between dual circular polarizations, as illustrated in Figure 1 below.

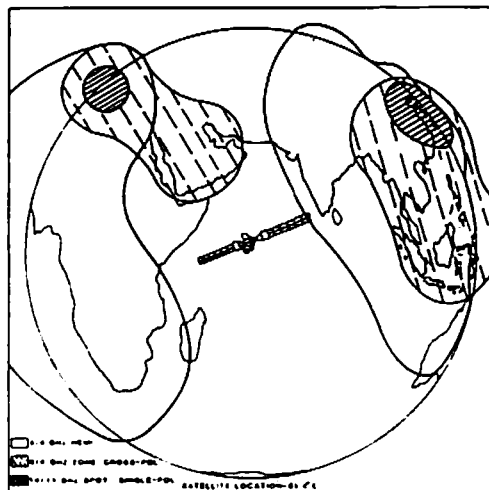


Figure 1: INTELSAT V Indian Ocean Coverage

The horn method of calibration was specifically devised for calibrating OTC(A)'s earth station antennas. It consists of locating a linearly polarized horn in the mouth of the beam waveguide in the antenna's aperture. The horn samples the test signals radiated to it and returns it to the measurement system for phase and amplitude calibration in the transmit measurement. Conversely, in the receive measurement, the signal radiated by the horn is passed on to the measurement system via the receive feed ports of the antenna.

Using this technique, OTC(A) successfully provided consultancy services to the New Zealand Post Office in the polarization performance measurements of Warkworth 2.

This paper will describe the theory behind the horn calibration method and how it can be used in the phase amplitude method of antenna axial ratio measurement.

References

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